WPS 3474

Choosing Formulas for Market Access Negotiations: Efficiency and Market Access Considerations*

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World Bank Policy Research Working Paper 3474, January 2005

* We would like to thank numerous friends and colleagues, and particularly Elwyn Grainger-Jones, Bernard Hoekman, Richard Newfarmer, Marcelo Olarreaga, Ernie Preeg, and Alan Winters for valuable comments. This paper is forthcoming as Chapter 5 in Jayasuriya, S. (ed.), *Trade Policy Reforms and Development: Essays in Honour of Professor Peter Lloyd*: Vol.2, Edward Elgar.

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Choosing Formulas for Market Access Negotiations

Non-Technical Summary

Economic principles suggest that formulas for tariff reduction should focus on reducing the highest tariffs by the largest amount. This raises efficiency by reducing the most serious economic distortions, and helps to maintain tariff revenues by increasing the volume of imports passing over relatively high tariff barriers. In the context of the Doha Round negotiations, there is an additional, and quite different, reason to prefer tops-down approaches. Many of the high tariffs that remain in industrial country markets are on products such as textiles and clothing that are of particular interest to developing countries. In part, this reflects the fact that developing countries were not active in the GATT's main game of exchanging market access concessions during the Kennedy and Tokyo Rounds, when the GATT process brought about the largest reductions in industrial-country tariffs.

Unfortunately, the use of tops-down approaches to liberalization makes negotiations difficult, since approaches that reduce high tariffs by more than low will likely have different effects on average tariffs in different countries. In the current negotiations, these differences have caused specific formulas advanced in both agricultural and non-agricultural negotiations to be rejected by countries that would have been required to make larger reductions. Clearly, then, it is important to understand what is to be gained from use of nonlinear, tops-down formulas.

In this paper, Francois, Martin and Manole abstract from differences in the required reduction in average tariffs in order to focus on the implications of different degrees of concavity in the tariff-reduction formula. More strongly concave formulas reduce higher tariffs more sharply, and lower tariffs less strongly in order to maintain the same reduction in average tariffs. They use the framework of the flexible Swiss formula introduced by Francois and Martin (2003), to examine different degrees of nonlinearity within the same broad family of tariff reduction formulas.

Francois, Martin and Manole focus on the major industrial-country markets of the USA and the EU. They first examine the efficiency benefits to the USA and the EU of using more sharply concave tariff-cutting formulas for their own tariffs. Given the low level of average tariffs, they find that these pure efficiency effects are very small. More sharply tops-down approaches are shown to provide larger welfare gains, although these changes are small in absolute value. When attention focuses on the change in market access experienced by developing countries, the importance of a tops-down approach is considerably reinforced. If average tariffs in the USA and in the EU are cut by an average of 50 percent using the sharply tops-down Swiss formula, the cut in the average tariff faced by developing countries is 56 percent in the USA and 55 percent in the EU. As more flexibility is introduced and the tops-down emphasis is diluted, the formula comes closer and closer to the proportional-cut case, the market-access gain to developing countries is reduced, falling to 50 percent with a pure proportional cut. While more work is clearly needed to generalize these results to specific countries, they suggest that developing countries may have a stronger interest than previously recognized in pressing for strongly tops-down tariff-cutting formulas.

Choosing Formulas for Market Access Negotiations: Efficiency and Market Access Considerations

Abstract: An important issue in multilateral trade negotiations is the approach taken to reduce tariffs. We believe that there are important advantages in formula approaches, and survey a range of options between the sharply tops-down Swiss formula and proportional cuts in tariffs. Over the range we consider, we find that the economic efficiency impacts for the importer are not greatly influenced by the extent to which higher tariffs face bigger cuts. However, tops-down approaches appear to be more effective in reducing tariff escalation, and provide greater market access gains to poor countries.

Keywords: market access, tariff formulas, WTO, tariff reductions
JEL codes: F13, F1

1. INTRODUCTION

There is a now a clear understanding that there are wide divergences between the broad approaches to tariff reduction initially proposed by different participants in the Doha Development Agenda. In his overview of the agricultural negotiations, Harbinson (WTO 2003a) emphasized the wide divergence between the Uruguay Round approach to tariff reduction favored by Switzerland, Europe and Japan, and the more strongly tops-down Swiss formula favored by Uruguay, other Cairns Group members and the United States. He asked whether there were alternative approaches that might be used to form a basis for a compromise between the two approaches. In the negotiations on non-agricultural market access, the draft declaration for the ill-fated Cancun Ministerial moved away from earlier proposals involving a Swiss formula for non-agricultural market access, instead calling for delegates to seek a "non-linear" tariff reduction formula to be determined (WTO 2003d). Difficulties in identifying formulas that satisfied ambitions for reducing high tariffs more than others and desires for broad equality of "sacrifice" resulted in the WTO's July 2004 Framework focusing on vague "tiered" formulas for agriculture, and non-linear formulas for non-agricultural products (WTO 2004).

There seems to be broad agreement in the Doha Development Agenda negotiations on the desirability of a formula-based approach to tariff reductions, and many different formulas have been proposed. Some of these formulas--such as the Uruguay Round approach to agricultural tariff reduction-- allow discretion in assigning tariff cuts at the individual tariff-line level. Others are specified on a line-by-line basis, removing policy makers' discretion at the individual product level.

A major difficulty in comparing the different formulas under consideration is that they differ in many key respects, including the extent to which they reduce average tariffs and the extent to which they are tops-down in reducing high tariffs relative to lower rates. Our objective in this paper is to provide a framework for evaluating the trade offs between approaches such as the Swiss formula that are sharply tops-down, and approaches such as the proportional cuts approach that are less targeted to reducing peak tariffs.

The potential benefits from use of a formula approach are large. If a suitable tops-down formula can be identified and implemented, we can be relatively sure that it will lead to a global welfare gain, since the social costs of tariffs generally rise more rapidly than the rates themselves[1] By contrast, approaches that focus on reducing relatively low, "nuisance" tariffs face the risk of reducing economic welfare and tariff revenues by diverting imports away from higher-tariff items (see Martin 1997).

An important message from analysis of actual tariff data appears to be that the critical feature of a formula approach for welfare in the importing countries is not so much the flexibility of the formula (i.e. its willingness to go soft on peak tariffs) but rather the specification of a targeted reduction in the average rate. In other words, as long as a reduction in the average is still met, introducing some added flexibility by moving closer to proportional tariff cuts may not greatly reduce the importing country's gains from a tops-down approach. However, moving away from a strict tops-down approach in the industrial countries does seem to reduce the market access gains for low-income countries in industrial country markets.

This paper is organized as follows. In Section 2, we first provide some detail on the current market access landscape. This highlights important issues related to tariff peaks, unbound tariffs, and gaps between bound and applied rates that will be important determinants of success for any formula approach. In Section 3, we then consider some formula-based approaches. In Section 4, we set out the concept of "flexible formula" approaches. In Section 5, we consider some practical implementation issues. For illustration, and to assess the quantitative implications of alternative formulas, we examine an initial sample of 3 industrial countries and 3 developing countries in Section 6. In Section 7, we consider the tradeoffs between increasing flexibility and two dimensions of the cost of doing so—the reductions in efficiency in the importing country, and reductions in the cuts in average tariffs facing developing countries.

2. A Quick Tour of the Market Access Landscape

Tariff negotiations in the multilateral trading system have generally been based on tariff bindings, or schedules of concessions tabled under GATT rules, and the coverage and level of these bindings is an important element of the initial conditions for negotiation. Table 1 provides information on the share of industrial-product tariffs (on a trade-weighted basis) that remains either unbound or bound above applied rates. While tariffs in the OECD (and Latin America) are generally bound, many Asian and African economy tariffs remain unbound despite more than a four-fold increase in the coverage of developing-country tariff bindings in the Uruguay Round (Abreu 1996). For almost all developing countries, existing bindings are, on average, well above applied rates, reflecting a combination of relatively high initial bindings, and the

[1] See Vousden 1990, p233. López and Panagariya (1992) point out that the presence of non-produced intermediates weakens this general proposition.

subsequent sharp wave of reductions in applied rates. (See Blackhurst *et al* 1996, Francois 2001, World Bank 2001).

In addition to general Uruguay Round commitments, some important sectoral "zero-for-zero" agreements are reflected in the next-to-last column of Table 1. OECD economies have between roughly 10% and 30% of tariff lines bound at zero percent. Laird (1998) estimates that zero-for-zero increased developed country duty-free imports to 43% of total imports.

With the implementation of Uruguay Round commitments, average *ad valorem* tariffs on non-agricultural products in the industrial countries generally are around 3 percent. This is reflected in the first columns of Table 2. However, there are important exceptions such as textiles and clothing, where the average rate is roughly three times the overall average. This is reflected in the standard deviation and maximum tariff columns. With full implementation of current commitments, we estimate a simple average industrial tariff in the United States of 3.2 percent, a standard deviation of 4.3, and a maximum tariff of 37.5 percent. The European Union has a higher average, but less dispersion. We estimate an EU average of 3.7 percent, a standard deviation of 3.6 percent, and a maximum tariff of 17 percent.

For the developing countries in Table 1, average industrial tariffs range from a low of 3 to 4 percent to a high of more than 20 percent, estimates that are biased downwards by the omission of specific, compound and mixed tariffs from the data we utilized[2]. Table 2 presents detailed data for three developing countries: Brazil, India, and Thailand. These countries span the spectrum of developing country bindings as reflected in Table 1. Brazil's tariffs are all bound, though the average rate for industrial products is 14.9 percentage points above the current applied rate. We refer to this gap below as "*binding overhang*." India and Thailand's tariffs are partially covered by bindings, again with significant binding overhang.

As in the case of industrial tariffs, the stage for the agricultural negotiations was largely set by the Uruguay Round. One key difference from industrial products is that essentially all agricultural tariffs are bound. However, in both industrial and developing countries, there is a large degree of binding overhang resulting from "dirty tariffication" or the use of "ceiling bindings" (Hathaway and Ingco 1996).

3. Some Tariff Reduction Formulas

A range of tariff-cutting formulas has been considered or implemented under GATT and regional trade arrangements. In this section, we focus on formulas implemented on a line-by-line basis, leaving discussion of discretionary approaches to Section 5. Stern (1976), Laird (1998), Laird and Yeats (1987) and Panagariya (2002), WTO (2003c) and World Bank (2003) survey a range of alternative line-by-line formulas. The first is a simple proportional cut, frequently described as a linear cut in policy discussions:

[2] This omission has recently been remedied for applied rates in a few countries in the WTO's Integrated Database and the UNCTAD TRAINS database available through the World Bank's *World Integrated Trade Solutions* (WITS) program, and in data compiled by the International Trade Centre and CEPII.

$$t_1 = c \cdot t_0 \tag{1}$$

Where t_0 is the initial tariff (which may be an MFN applied rate; a preferential rate in a regional negotiation; or a tariff binding in the WTO context), t_1 the rate after application of the formula and c is the constant proportion of their original rate to which tariffs are to be reduced.

After years of negotiations aiming to accommodate differences in countries' initial tariff rates (Preeg 1970), a 50 percent proportional cut formula was used in the Kennedy Round (1963-67). In the end, some products were exempted from this approach and permitted smaller tariff reductions on the grounds of their sensitivity. Since the products exempted had much higher than average tariffs, these exemptions substantially reduced the cut in the overall average tariff. Baldwin (1987, p43) estimates that, despite these exceptions, the reduction in average tariffs on industrial products was 35 percent. This compared extremely favorably with the average of 2.5 percent achieved in the second through the fifth rounds of GATT tariff negotiations, generally conducted under the request-and-offer approach.

An alternative proposal considered in the Tokyo Round negotiations, and suggested in a different form in the Doha negotiations by Konandreas (2003) was a general linear reduction approach:

$$t_1 = d + f \cdot t_0 \tag{2}$$

where d is a positive constant and f is a number between zero and one. As with equation (1), this formula may be written with tariffs in percentage or proportional terms by making an appropriate adjustment to the parameter d.

Formula (2) suffers, however, from a potentially serious problem with low tariff rates. If the parameter d exceeds zero—which it must to yield larger percentage reductions in higher rates—this formula will lead to increases in lower rates. While there may be a case for some such increases in tariffs as a way of reducing the variation in tariff rates and hence the cost of protection, such increases in tariffs do not sit easily with the trade liberalizing *raison d'etre* of the WTO. To deal with this problem, the proponents of this approach during the Tokyo Round advocated that it be applied only for tariffs greater than 5 percent (Laird and Yeats 1987).

The formula accepted in the Tokyo Round was the Swiss formula:

$$t_1 = \frac{a \cdot t_0}{a + t_0} \tag{3}$$

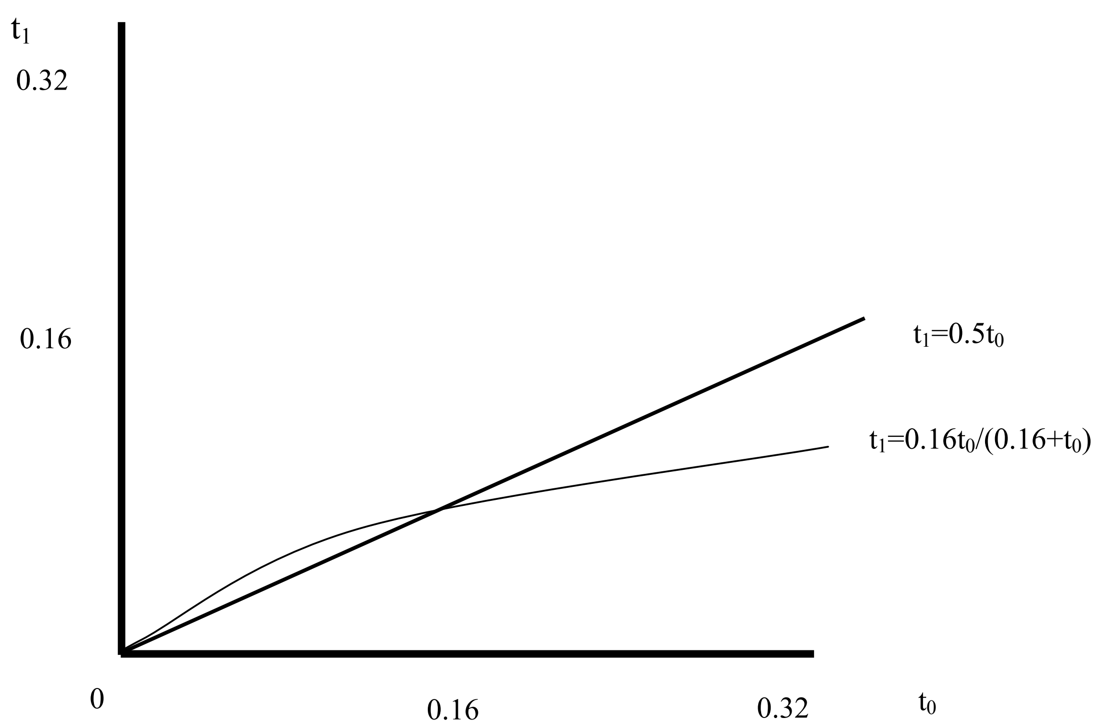
where a is a positive tariff rate that becomes a ceiling on tariff rates. If tariffs are expressed in proportional terms, then the Tokyo Round value of this parameter was in the range from 0.14 to 0.16. For tariffs in percentage terms, the corresponding parameter values are 14 to 16. In the Doha negotiations, the United States and the Cairns Group proposed use of the Swiss formula with a coefficient of 0.25 for agriculture.

The Swiss formula has a number of desirable features for tariff negotiations. The concavity of (3) in the initial tariff rate means it has the desirable feature of reducing higher tariff rates by more, in both absolute and relative terms, than lower tariff rates. It is particularly effective in reducing peak tariffs, since even the very highest tariffs are reduced below the value *a*. From the importers' point of view, tops-down approaches tend to reduce the economic efficiency losses associated with high and widely dispersed tariffs, and to preserve revenues, since import volumes tend to increase more on the higher-tariff goods. From the point of view of developing country exporters, tops-down approaches like the Swiss formula might also be expected to lead to greater market access gains to developing countries given the existence of industrial country tariff peaks in agriculture, textiles and clothing.

To understand the Swiss formula it is useful to examine particular cases. For an extremely small initial tariff, say one tenth of one percent, the coefficient by which t_0 is multiplied in equation (3) ($a/(a+t_0)$) is essentially one, so there is essentially no reduction in the tariff. For an initial tariff rate of *a*, the final tariff rates is a half of *a*, implying a 50 percent reduction from the initial tariff. For a very high initial tariff, $t_0/(a+t_0)$ is approaches one and the tariff rate is effectively reduced to *a*.

A very stylized comparison of the proportional tariff cut of 0.5 used in the Kennedy Round with a Swiss Formula using the parameter 0.16 from the Tokyo Round is given in Figure 1. The diagram shows that the cuts in low tariffs are smaller using the Swiss formula than using the proportional cut formula, but that the cuts for tariffs above 0.16 are larger with the Swiss formula. While the figure does not make this clear, no tariff would remain above 0.16 following application of this formula.

Figure 1. Impacts of a Proportional and a Swiss Formula for Tariff Cutting



A number of other formula-type approaches to structuring market access expansion have been proposed. Josling and Rae (2004) consider alternatives including reduction of bound rates to applied rates; the introduction of ceilings on tariffs; and “cocktail” approaches with different formulas, such as reductions to a ceiling rate, proportional cuts and Swiss-formula cuts over different ranges of tariffs. Hoekman and Olarreaga (2002) examine the introduction of a limit on the ratio of the highest tariffs to the average as a means of dealing with tariff peaks. The proposal by China, and the subsequent proposal by the Chair of the Market Access Committee in the Doha negotiations (World Bank 2003) on non-agricultural market access introduced a Swiss formula with an *a* coefficient based on each country’s initial average tariff.

4. INTRODUCING SOME FLEXIBILITY TO LINE-BY-LINE FORMULA CUTS

There are good reasons to question whether a pure Swiss formula, with a common upper limit of around 0.15 as used in the Tokyo Round, would provide sufficient flexibility for all WTO members to reach agreement on tariff reductions in agriculture or non-agriculture in the Doha negotiations. In fact, it seems very possible that the lack of flexibility of the Swiss formula contributed to the exclusion of large numbers of products with high tariffs from the formula in the Tokyo Round. Unfortunately, many of these products were items such as agricultural products, textiles and clothing that are of particular interest to developing countries, which were not active participants in the exchange of market access concessions at that point.

Hoekman and Olarreaga (2002) note that peak applied tariffs in the industrial countries are now around 50 times as high as the average rate. This contrasts with a ratio of five in the developing countries of Sub-Saharan Africa, six in Latin America, seven in the Middle East and North Africa, nine in South Asia, and 28 in East Asia. Clearly, the widespread use in developing country trade reforms of tops-down liberalization approaches noted by López and Panagariya (1992) has had a profound impact on the distribution of developing country tariffs. The combination of quite large differences in the means and the variances of tariffs across countries seems likely to create a need for a formula that could encompass the entire distribution of tariff rates while minimizing pressure for exceptions and special cases.

One possible approach to dealing with this problem involves application of a Swiss-type tariff reduction, with a ceiling based on the individual country’s initial average tariff rather than a common Swiss formula parameter *a*. In effect, this combines the targeting of the distribution of tariffs under the pure Swiss formula with the targeting of a reduction in the average tariff. This <u>targeted formula</u> approach reduces the “one size fits all” problem of a common *a* parameter. However, it still leaves potential political problems created by the very sharp tops-down nature of the pure Swiss formula.

To address the flexibility problem, one might generalize the Swiss formula to allow more flexibility in dealing with different tariff profiles, as suggested in Francois and Martin (2003). Under this <u>flexible formula</u> approach, the idea is to allow greater flexibility of approach to accommodate different preferences over tariff maxima and rates of reduction.

One way to provide some additional flexibility is to modify the original Swiss formula by introducing an additional parameter, *b*, into equation (5) to obtain:

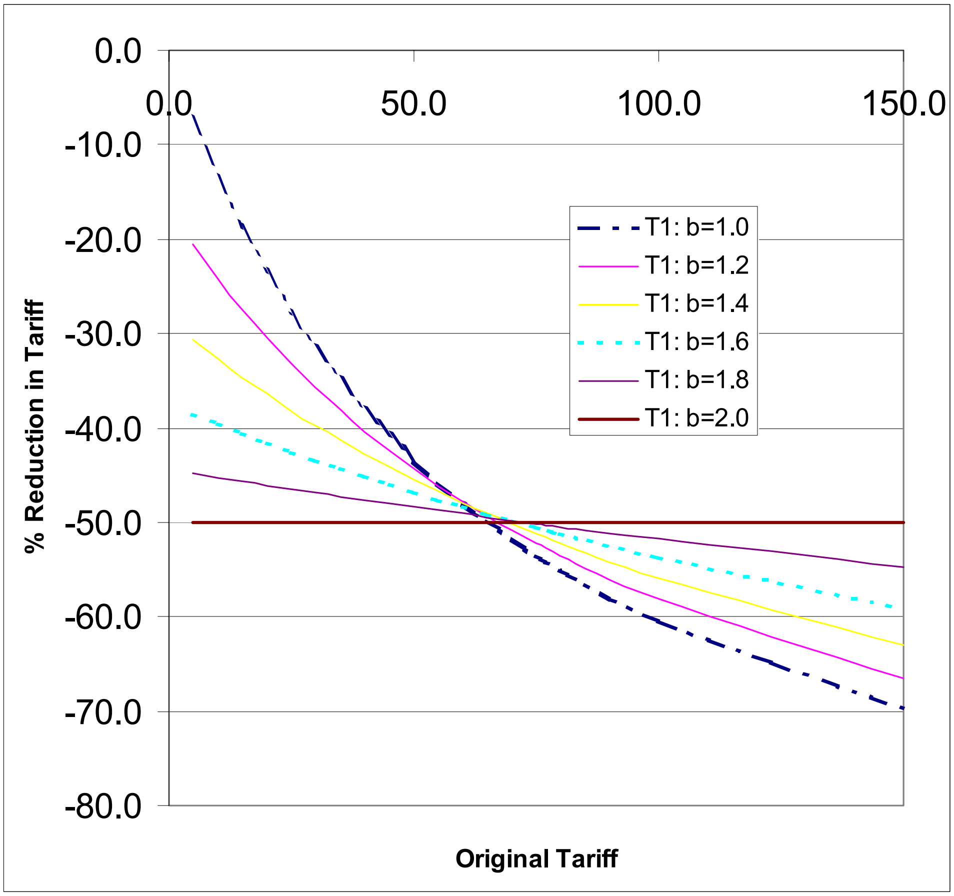
$$t_1 = \frac{a \cdot t_0}{a \cdot b + t_0} = \frac{1}{a^{-1} + b \cdot t_0^{-1}} = \frac{a \cdot \frac{t_0}{b}}{a + \frac{t_0}{b}} \tag{4}$$

We call parameter *b* a flexibility parameter as it allows the shape of the relationship between the initial and final tariffs to change[3]. As can be seen from the second term in equation (4), the original Swiss formula is a special case of equation (4), with $b = 1$. As will become evident, the impact of tariff reductions on peak tariffs can be softened by raising the *a* parameter. As *b* increases, the formula tends to increase the reduction in the lower tariffs, allowing for higher maximum rates with the same target reduction in the average tariff. The third expression in (4) shows that the flexible formula can be seen as a combination of a proportional cut and a Swiss formula. If $b > 1$, then one can see the approach as first imposing a proportional cut on t_0 to obtain $\frac{t_0}{b}$; then subject $\frac{t_0}{b}$ to a Swiss formula. Clearly, there is an entire family of flexible Swiss formulas, distinguished by their *b* values[4]. Comparing these formulas directly is difficult since changing *b* changes both the curvature of the line and the average depth of cut. like Microsoft EXCEL's Solver can be used to find the combinations of *a* and *b* consistent with the targeted reduction in average tariffs and hence allow formulas with different curvature, but the same depth of cut in average tariffs, to be compared.

To avoid formulas that increase the value of some tariffs, the flexibility parameter, *b,* should be one or above. This extended Swiss formula retains the key feature of the original Swiss formula that all tariffs are reduced below a ceiling given by *a*. Figure 2 illustrates, for an example with tariffs ranging from 0% to 90%, the percentage reduction in each tariff rate needed given a target of a 50% reduction in the average tariff. As shown, there is some scope for trading off cuts in higher tariffs with cuts in lower tariffs through adjustments to the compensation parameter. This family of curves clearly provides much greater flexibility to negotiators who had, hitherto, to choose one or the other approach.

[3] The first expression in (4) shows its similarity to the original Swiss formula. The second shows the source of the asymptotic feature of the formula—division by a rectangular hyperbola in the tariff rate.
[4] This might be called a Swiss-Army-knife approach to tariff reduction.

Figure 2. Flexibility and Swiss Formula-Based Tariff Reductions



There is a limit to the flexibility we can obtain using the compensation parameter. As we raise *b,* we are substituting larger cuts in smaller tariffs for smaller cuts in higher tariffs. Beyond some point, it becomes infeasible to meet the required reduction in average tariffs. As shown in Francois and Martin (2003), adopting a combined targeted and flexible Swiss formula approach guarantees that peak rates will be cut by at least the cut in the average, even with flexibility.

5. SOME PRACTICAL ISSUES

Several practical issues arise in the implementation of formula cuts. These include the specification of the goal in terms of the depth of cut; the choice of the base rate to be cut; and the potential need for additional flexibility in the negotiations.

5.1 Average cuts or cuts in the average?

One fundamental parameter in negotiations is the objective of tariff reduction to be specified. Should it be specified in terms of a percentage reduction in average tariffs (simple or weighted); or in terms of an average tariff cut; or in terms of a ceiling tariff like the 0.15 used in the Swiss formula during the Tokyo Round; or as an average reduction in the price of imports[5]? One widely-advocated approach to tariff reduction, the Uruguay Round approach to agricultural trade liberalization, specifies its objective in terms of an average cut in tariffs, and leaves countries free to choose the reductions at a tariff-line level, perhaps subject to a minimum cut requirement.

The difference between a cut in average tariffs and an average cut in tariffs seems minor, but is actually fundamental. Both in line-by-line approaches, and in those involving discretion at the tariff–line level, a cut in average tariffs is an appealing organizing objective in that it provides a measure of progress from the initial regime towards complete free trade. By contrast, an average-cut criterion is always close to meaningless since it does not take into account whether the cuts take place in high or low tariffs. Under discretionary approaches, an average-cut criterion encourages large percentage cuts in low tariff-rate commodities, as was evident in the Uruguay Round agreement on agriculture (Hathaway and Ingco 1996), and may lead to little or no reduction in average tariffs. By leaving peak rates relatively unscathed, it may also exacerbate tariff escalation.

Proposals to use the Uruguay Round approach of a 36 percent average cut in tariffs, with a minimum cut of 15 percent in each tariff line seem likely to result in much less liberalization than the "headline" 36 percent cut. Since members would be able to choose the tariff lines on which they make larger or smaller cuts, it would be feasible to make a reduction in the average tariff rate of little over 15 percent. Consider, for example, a case where a country has just two tariff rates, one percent and 100 percent, and policy makers want to minimize the change associated with this approach. The result is likely to be:

Large differences between average cuts in the tariff and cuts in the average tariff

	Good 1	Good 2	Average
	%	%	%
Initial tariff rate	1	100	50.5
Tariff cut	57	15	36
New tariff	0.43	85	42.7

As is evident from the table, the 36 percent average tariff cut can be achieved with a reduction in average tariffs of only 15.5 percent, less than half the specified goal. And virtually all of this is the result of the totally inflexible minimum cut requirement. Since higher tariffs are typically those that are most politically sensitive, there is every reason to expect countries to behave like the hypothetical country in the table. In this case, the result will be limited overall liberalization, and particularly small reductions in the peak tariffs that are of greatest concern to developing countries. With relatively large reductions in low tariffs and limited reductions in high tariffs, tariff escalation may even become worse.

With all countries keenly aware of the option to minimize liberalization, and expecting other countries to take advantage of this opportunity, the pressure on policy makers to minimize the extent of their liberalization would be intense. It seems likely that the outcome would be reductions of 15 percent in almost all tariff lines with

[5] This measure, defined for a small country by $\Delta t/(1+t)$, where Δt is the change in the tariff rate, is an important determinant of the increase in market access resulting from a negotiation.

significantly trade-restricting tariffs. This approach has been described by the World Bank (2003) as "the cut you have when you are not having a cut".

If a discretionary approach is adopted, it would seem more logical to specify a target cut in average tariffs rather than an average cut in tariffs. While preserving the discretion that advocates of discretionary approaches demand, a reduction-in-the-average criterion does impose some realistic discipline. An average-cut criterion imposes essentially no discipline, and hence provides no basis for an exchange of market access "concessions".

5.2 Choice of base rate

A key issue in implementing any formula-based approach is the base rate to which the formula should be applied. In a regional negotiation context, this rate will generally be the preferential applied rate. Countries using a formula approach to reform their own tariffs would generally use the applied MFN rate as the base. Traditional GATT practice has been to focus on the bound rates contained in countries' schedules of concessions. This has the important advantage of creating no disincentive for individual countries to undertake unilateral reductions in applied rates of the type that have so sharply reduced protection in developing countries during the past 20 years (World Bank 2001). In addition, this approach might be viewed as providing credit for unilateral liberalization in the sense that a prior unilateral reduction of applied rates reduces one-for-one the cut in applied rates required in subsequent negotiations.

Clearly, the choice of bound rates as the base would mean that some countries would have to make only small, or no, reductions in applied rates. Since WTO negotiations depend on meeting the needs of all participants, the approach to be adopted must meet the needs of participants. At the end of the day, countries will consider whether the reductions in their partners' applied rates, and the increases in the security of their market access, resulting from the chosen base and reduction formula (or other approach) are sufficient to make the resulting package worthwhile. Historical applied rates, such as the rates applying at the end of a previous negotiation, would give credit for autonomous liberalization since that time, but perhaps create some disincentive for future liberalization.

5.3 Additional flexibility

Even with the additional flexibility allowed by the extension of the Swiss formula offered in this paper, there is a risk that it would not be sufficiently general to meet the political constraints of all countries on all products. One way to deal with the problem of exceptions while allowing additional flexibility would be to make a formula cut first, and to allow for renegotiations with compensation <u>from this new base</u>. This approach shifts the onus in making exceptions from the country to its trading partners, and seems much less likely to lead to fewer and smaller exceptions than the traditional discretionary approaches. Clearly, it would ensure the maintenance of a balance of concessions—the perceived lack of which created such difficulties in the Kennedy and Tokyo Rounds.

5.4 Non Ad-Valorem Tariffs

Another potentially serious problem is created by specific, mixed and compound tariffs. Tops-down formulas such as the Swiss formula cannot be directly applied to these tariffs, since it is not possible to know which are the high and low tariffs without knowledge of the value of the goods. One option would be to convert all specific tariffs to *ad valorem* form prior to applying the formula, as is specified for non-agricultural goods in the Cancun Ministerial Declaration (WTO 2003d).

Whether the approaches outlined in this section and the previous section have any chance of being acceptable depends heavily on the nature of the distributions of applied tariffs and tariff bindings in member countries. The set of tables in the next section provides a very brief initial empirical assessment of the implications of formula approaches for a range of countries, taking into account the current distribution of their tariffs and tariff bindings.

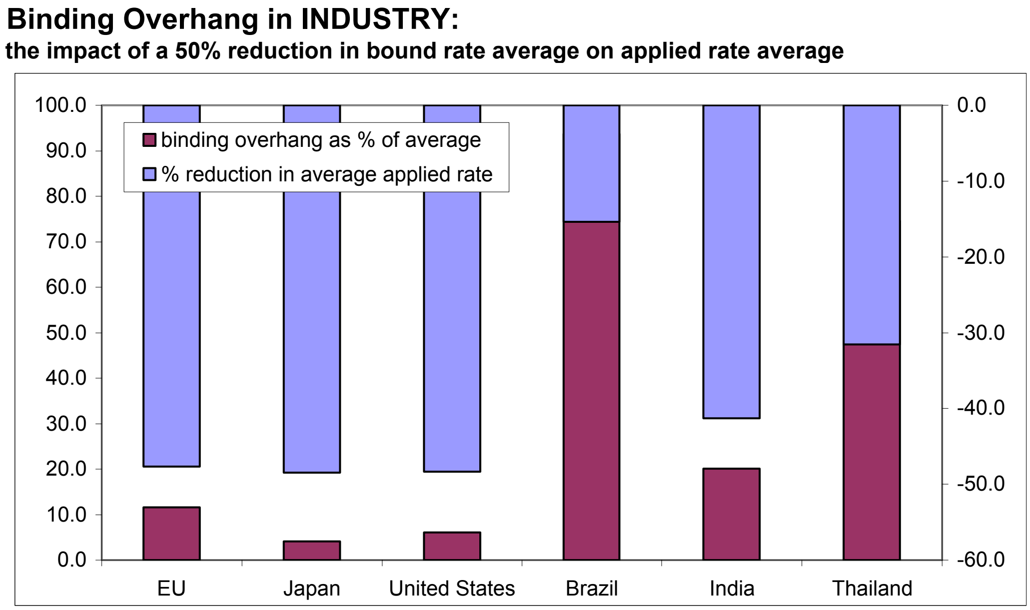
6. Some Examples

A simple, hypothetical analysis can illustrate some of the key implications of the approaches we discuss, including the implications of binding overhang. For concreteness, we specify:

- A target for reduction in simple average tariff bindings of 50%
- Unbound tariffs are initially bound at 150% of applied MFN rates
- The parameter *b* is initially set to 1 and is increased to 2.0
- Agricultural and nonagricultural tariffs were treated separately.

Tables 2, 3 and 4 present the effect of formula-based reductions on the tariff schedules of the EU, Japan, the United States (industrial countries) and Brazil, India, and Thailand (developing countries). Table 2 summarizes results for the basic Swiss formula, while Tables 3 and 4 illustrate the effect of adding flexibility while maintaining the same reduction in average bindings. These results are summarized in Figure 3.

Figure 3. Binding Overhang in Industry



For the USA, bound rates generally are very close to applied rates. This is reflected in low initial binding overhang (the gap between average bound and applied rates shown as a percentage of the average applied rate). This also means that all formulas considered lead to significant cuts. The result is a reduction in maximum rates, variance, and average rates. Notice from Table 3 that peak rates are not reduced as much when the flexibility parameter *b* is raised above 1. In particular, while still achieving a 50% reduction in the average bound rate, the USA would be able to keep its highest *ad valorem* applied rates on industrial goods in the range from 7.3 to 9.9 %, depending on the selection of the *b* parameter. Similarly, the EU would be able to keep some peak industrial rates at up to 4.5 times the average tariff.

In Brazil, by contrast, average bound rates are well above applied rates. This is reflected in Table 2, as well as Table 4 and Figure 3. With a 50% reduction in average bindings, Brazil's industrial average applied rate falls by 15.4% of its base value. While smaller than the proportional cut in average tariffs in the industrial countries, this translates into a larger percentage reduction in the cost of imports than those observed in the industrial countries. In agriculture, the binding overhang is so great that almost nothing happens to applied rates (a 50% reduction in bindings yields only a 3.7 percent reduction in applied rates.) However, the binding overhang would be reduced sufficiently to ensure real liberalization in subsequent negotiations, and to constrain potential future increases in tariffs.

India realizes a similar (i.e. very small) cut in applied agricultural tariffs, again reflecting high binding overhang in both developed and developing countries. The reduction in the average industrial tariffs is greater than in the case of Brazil. This reduction of 8 percentage points in the average tariff on industrial products implies a much larger reduction in the price of imports than in the case of the industrial countries.

Thailand, with less binding overhang, realizes greater reductions in agricultural tariffs, with these tariffs reduced by over 40 percent relative to their initial average level. In the industrial sector, Thailand's reduction in applied rates is just over 30 percent, which necessitates a reduction in applied tariffs of around 3 percentage points. This generates a reduction in the price of imports that is larger than in the industrial country cases considered.

In agriculture, the extent of binding overhang is much greater. Even with a large cut, such as the 50 percent cut in bindings considered here, we see only small reductions in applied rates on agricultural goods in Brazil and India. In Thailand, by contrast, we see sharp reductions in agricultural tariffs because of the limited binding overhang in this case.

7. Welfare Implications of introducing Flexibility

When considering an approach that would increase the political flexibility of negotiating modalities, it is important to have some idea of the potential economic costs of allowing such flexibility. One consideration is for efficiency in the importing country. For the single-country case, economic theory tells us that tops-down reductions in protection are likely to lead to greater welfare gains in the importing country than proportional cuts or, *a fortiori,* approaches that allow high tariffs to be reduced by less than low tariffs.

A second consideration is the potential distribution of market access gains between countries. Given the preponderance of tariff peaks in the products exported by developing countries to the industrial world, tops-down approaches seem more likely to reduce the tariffs that are of greatest concern to developing countries, and hence to increase their market access gains. This potential difference can be measured by examining the impacts of different approaches on the average tariffs facing developing countries.

7.1 Efficiency effects on the importer

Economic theory provides two classic rules of thumb for piecemeal tariff reduction in a single, small country— (i) that a proportional reduction in all tariffs will increase welfare, and (ii) that a reduction in the highest tariff will increase welfare as long as this good is a net substitute for all other goods (Vousden 1990, Chapter 9). Vousden also shows that these welfare-improving conditions apply to multilateral, as distinct from unilateral, trade reforms as long as compensation is allowed. These rules, and the simple intuition given above, are strongly suggestive that a formula, such as the Swiss formula, that is strongly tops-down will be welfare-improving—and more strongly welfare improving than a proportional cut. The actual difference between a Swiss-formula type cut and a proportional cut, though, is ultimately an empirical question. Theory tells us the direction of the difference ("Swiss is better than proportional"), but not the magnitude.

A simple approach to investigating whether use of greater flexibility, and hence a move away from strongly tops-down to a more proportional cut will have major welfare implications is to draw on the distorted trade expenditure function introduced by Lloyd and Schweinberger (1988), and further developed by Anderson and Neary

(1992). While we could take a computable general equilibrium (CGE) modeling approach, this would require considerable aggregation of the tariff data, which might cause us to lose information in the dispersion of tariffs within the twenty or so aggregates routinely used in CGE analysis. Instead, we have used a more disaggregated, but simpler, model with around 5000 tariff lines identified separately, and identified as substituting in Armington fashion relative to a single, domestically produced good[6].

We begin by representing the relevant features of the economic structure with the welfare evaluation approach of Lloyd and Schweinberger -- a distorted trade expenditure function:

$B = e(p, v) - g(p, v) - z_p(p,v,u).(p-p^*)$	(5)

where B is the balance of trade, e is the expenditure function in a vector of domestic prices and total utility, u; g is revenue from production as a function of domestic prices and a vector, v, of resources (we might generalize this by using a profit function with variable intermediate inputs); z_p is the derivative of $(e\text{-}g)$ and equal to net imports of each good; and p^* is a vector of world prices.

If we assume a standard Armington-type structure in a small economy, with imports differentiated from domestic goods, but domestic goods perfectly substitutable with exports, then we can simplify the analysis of tariff changes by focusing only on e(p,u) and the tariff revenue function. When tariffs change, there will be no change in the realized value of $g(p,v)$ and it can be ignored, unless there are distortions such as export taxes.

To make the approach easy to apply, we write the expenditure and revenue functions using a Constant-Elasticity of Substitution functional form for the expenditure function and a tariff revenue function based on the import demand functions derived from the first derivatives of this function with respect to prices. In this situation, for a single economy, the relevant elements of the distorted trade expenditure can be written:

$$B = [\Sigma_j\ \beta_j(p_j^*(1+t_j))^{(1-\sigma)}]^{1/(1-\sigma)}.u \quad - \quad \Sigma_j\ p_j^*.\beta_j.[p_j(1+t_j)/P]^{-\sigma}.u$$

where $P = [\Sigma_j\ \beta_j(p_j^*(1+t_j))^{(1-\sigma)}]^{1/(1-\sigma)}$, σ is the elasticity of substitution, and the β_j's are the distribution parameters of the CES expenditure function.

We calibrate this function using data on imports from the UNCTAD TRAINS database, and data on consumption of domestically-produced goods from the World Bank's World Development Indicators. In line with standard practice in the CGE literature, all domestic prices were initially set to unity to allow decomposition of value data into prices and quantities. This allowed the β coefficients to be determined from the value share data at domestic prices. A σ value of 4 was assigned, raising the elasticity of substitution above that in most empirical estimates of import demand

[6] A better longer-term solution to this problem would be to utilize a two-stage aggregation approach like that proposed by Bach and Martin (2001).

functions on the grounds that we are dealing with very finely disaggregated trade data for which relatively high elasticities of substitution might be expected.

While the analysis in the earlier sections of this paper was undertaken for agriculture and for industrial products separately, in line with the negotiations at WTO, this approach would not be satisfactory for our welfare analysis. Second-best effects associated with reducing one set of tariffs, while leaving another set unchanged, might overwhelm the welfare effects of interest to us—those associated with different degrees of progressiveness in the reduction of high tariffs[7]. Finally, the goal of this section is primarily illustration. Therefore, we repeated the analysis using the extended Swiss formulas to reduce all tariffs in each sample country.

The tariff schedules of USA, and the European Union have been analyzed for the case of a 50 percent reduction in simple average tariffs. These results are presented in Table 5 for the three different values of the *b* parameter identified in the earlier tables. The gains are, as might be expected, very small, given the very low levels of the *ad valorem* tariffs included in the database. As might also be expected, the gains from reform for the United States rise as the tariff reduction formulas are made more strongly tops-down. However, the differences between the gains with different degrees of flexibility are quite small. A similar pattern emerges for the European Union. In both cases, moving from the standard Swiss formula to a Swiss formula with a flexibility parameter of 1.5 causes only a very small reduction in the welfare gains from liberalization.

What do these results suggest? The results are of course very partial, reflecting only the efficiency gains from own-country liberalization. Further, they are based on tariff information that excludes the effects of specific, compound and mixed tariffs, and other charges such as antidumping duties. However, they are based on very widely dispersed real-world tariff data collected at a fine level of disaggregation, and probably do have some relevance for inferences about national and global efficiency gains from trade reform. We would draw the following conclusion. Whether and how we add flexibility is second order, and should not be a roadblock to achieving a reduction in the average. This means that the selection of which formula to choose, at least among the tops-down options spanned by the flexible Swiss formula, is nowhere near as important as the more basic issue of simply selecting and imposing a targeted reduction in the average[8]. It may be better to simply focus on achieving large reductions in average tariffs, even if the price is acceptance of an approach, such as a pure proportional cut, that allows some tariffs to remain relatively high. This result may, of course, not be acceptable, in particular if such approaches are found not to achieve needed reductions some of the key tariff peaks restricting global market access, and particularly market access by developing countries.

[7] The importance of this problem can readily be overstated. At least at the level of aggregation used in a CGE model, Hertel and Martin (2001) found that these second-best welfare impacts were very small in a prospective new round of WTO negotiations.

[8] Of course, if escalation-increasing approaches such as the Uruguay Round approach are considered, it may well be important to consider more than the resulting reduction in the average.

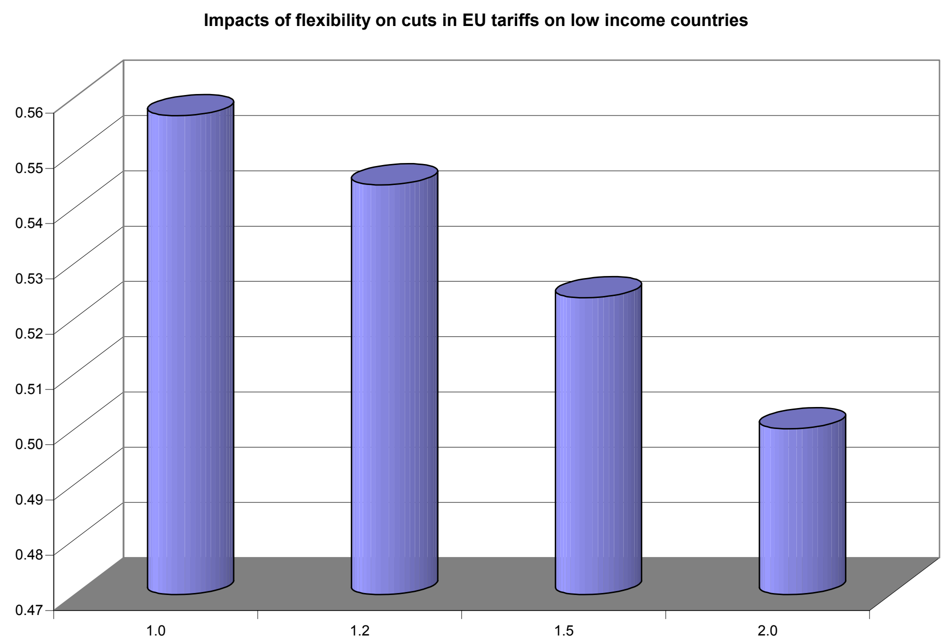
7.2 Market access gains to developing countries

A key empirical issue is the extent to which changing the dispersion of overall protection, for a given average cut in tariffs, affects the average reduction in protection facing developing countries. In contrast with the efficiency issue addressed in 7.1, there is little that theory can say to guide whether tops-down cuts will be more successful in reducing the barriers facing developing countries. However, we do know that developing countries generally face higher MFN tariff barriers against their exports than do industrial countries (World Bank 2003, Chapter 2). Many have concluded that this difference reflects to a significant degree the limited presence before the Uruguay Round of developing countries in the "main game" of multilateral negotiations—the exchange of market access concessions. Whatever the cause of this discrepancy, it implies that approaches that attack tariff peaks more aggressively are more likely to be beneficial to developing countries, the greater the extent that developing countries face disproportionately high tariffs.

To examine this issue, we increase the *b* parameter in equation (4) to reduce the concavity of the tariff cutting formula. At one extreme, we consider the classic Swiss formula set in such a way that it brings about a 50 percent reduction in tariffs with the greatest reductions, by far, in the highest tariffs. Then, we allow for increasing degrees of flexibility up to the point where all tariffs are reduced by a flat 50 percent. This is done by increasing the flexibility parameter in the extended Swiss formula from 1.0 to 2.0.

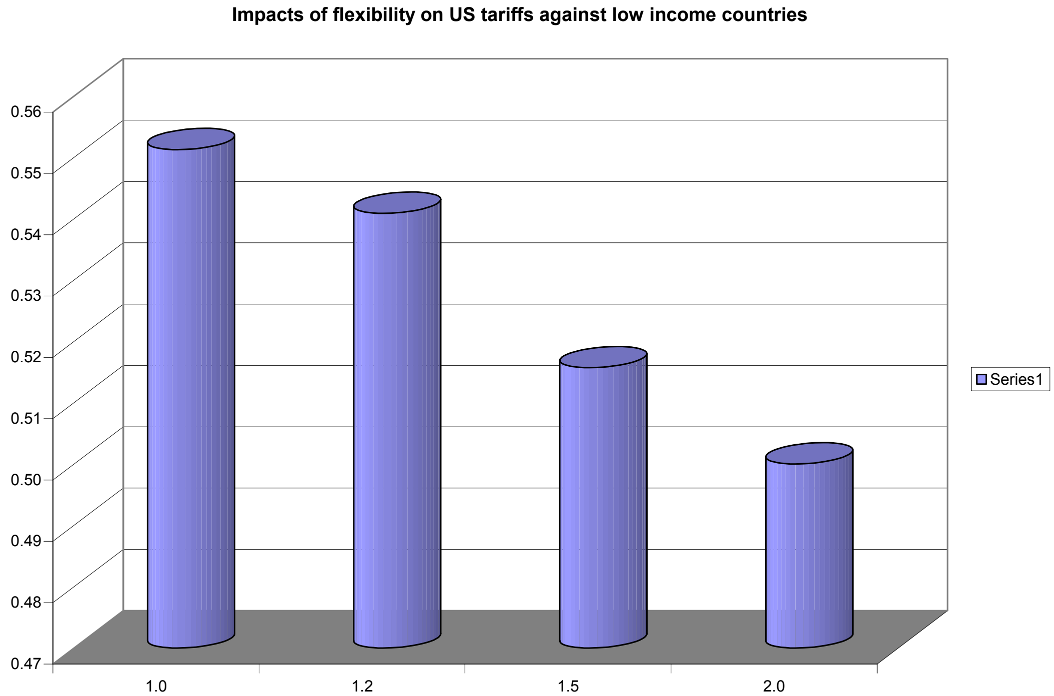
The results of this analysis are presented in Figure 4 for EU tariffs faced by exports from low-income countries, and in Figure 5 for US tariffs faced by the same countries. In each case, the values of the flexibility formula are shown on the horizontal axis and the proportional reduction in tariffs on the vertical axis. We find that a classic Swiss formula used to target a 50 percent cut in the simple average tariff on imports into these two large economies does indeed lead to larger reductions in the weighted average tariffs facing low-income countries. In the case of the USA, the reduction in tariffs is 56 percent, while in the European Union, the reduction is 55 percent. Then, as the flexibility of the cuts is increased, the reductions in average tariffs faced by the low income countries fall progressively, to 50 percent when tariffs are cut proportionately.

Figure 4. Implications of alternative tariff-cutting rules for EU tariffs facing low-income developing countries.



Note: average tariffs are shown on the vertical axis.

Figure 5. Implications of alternative tariff-cutting rules for US tariffs facing low-income developing countries.



Note: average tariffs on the vertical axis.

Clearly, this simple, exploratory analysis confirms our initial hypothesis that tops-down approaches produce larger reductions in tariffs facing low income countries for any given reduction in the importers' average tariff. This gain is an important equity reason to favor strongly tops-down approaches to tariff cutting—such as the Swiss formula-- over more flexible, and perhaps more politically saleable, alternatives such as a proportional cut. It seems likely that approaches that allowed peaks to be retained, such as an average-cuts rule would further reduce the market access gains for poor countries.

8. CONCLUSIONS

In this paper, we first considered the advantages of formula approaches to trade negotiations, and noted the apparently widespread acceptance of these advantages in the current WTO negotiations under the Doha agenda. An important feature of these negotiations is the search for compromises between those seeking aggressive tops-down market liberalization, and those seeking more limited liberalization, or seeking to avoid reform altogether.

We then examined the key features of the market access landscape that will affect the choice of approaches to negotiations. These features include the large dispersion of average tariffs among the active participants in the negotiations, and the large gaps between applied and bound tariff rates in many countries and sectors.

In implementing a formula approach, one key practical issue is whether countries are to have discretion in the depth of cuts on individual tariff lines. Where countries have discretion, an average-cut criterion was shown to provide essentially no discipline. A seemingly similar, but in fact fundamentally different, criterion of a required reduction in the average tariff rate would potentially introduce some discipline by requiring cuts in at least some high tariffs.

Our review of potential approaches to tariff reduction covers a range of line-by-line tariff formulas. The Swiss formula approach used in the Tokyo Round is seen as particularly desirable because of its ability to introduce a tariff rate ceiling, and to bring about larger reductions in the highest tariff rates. Unfortunately, it may be too restrictive to be fully applied in its original form, particularly because of the large dispersion in the average and dispersion of countries' tariff rates, and the presence of binding overhang in many countries.

To overcome, or at least reduce, this restrictiveness, we examined the implications of targeted and flexible Swiss formula approaches. The first is a simple adaptation of the Swiss formula that is targeted to a specific reduction in average tariffs for particular country and commodity groups (eg agricultural and non-agricultural). The second is a more flexible version of the Swiss formula that would allow the same cut in the average tariff to be achieved with somewhat smaller reductions in peak tariffs. Essentially, this increase in flexibility would allow larger cuts in smaller tariff rates to be used to compensate for smaller reductions in higher tariffs. While such a change would almost certainly reduce economic efficiency, it may ultimately be preferable to a retreat into exceptions as a way of reaching a politically-acceptable agreement. This flexible formula approach potentially allows for a Swiss family of formulas, or a Swiss-army-knife type collection of instruments, with different tradeoffs between tariff cuts on higher and lower tariff rates.

We examine the potential outcomes of applying this family of formulas in three industrial country markets—Europe, Japan and the USA—and three developing country markets—Brazil, India and Thailand. As an illustration, we target cuts in average bound tariff rates in each country, considering agricultural and industrial products separately. Preliminary analysis suggests that, in this situation, only a bold cut, such as the 50 percent target used in the Kennedy Round, would make substantial progress in increasing market access in both developing and developed countries.

In the final section of the paper, we develop two simple methodologies for evaluating the consequences of different tariff formulas. The first approach evaluates the welfare consequences for the importer of different tariff reductions. When the welfare implications of different versions of the flexible Swiss formula are considered over the range from the Swiss formula to a proportional cut, we find that the gains are very similar for different degrees of flexibility. This is illustrated with data for the USA and the European Union. The basic qualitative message is the same in both cases. Increasing flexibility appears to have only a small impact on the efficiency gains accruing from a 50 percent tariff cut. From the point of view of economic efficiency in the importing country, this result suggests that the depth of cut in the average tariff may be more important than the extent to which this reduction is brought about by reducing tariff peaks.

The extent to which the formula used succeeds in bringing down high tariff rates relative to others seems to matter more for developing countries' market access. Because many of the exports of developing countries face high tariffs in the industrial countries, we anticipated that tops-down approaches might be more effective in increasing the market access of developing countries. This expectation was borne out—formulas that reduced peak tariffs in the industrial countries more sharply gave developing countries greater increases in market access for any given reduction in average tariffs.

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Table 1. Industrial tariff rates and bindings -- post UR and ITA						
	Percent of MFN imports that are subject to:				Tariff lines	
	bound tariffs	unbound tariffs	tariffs bound above applied rates	tariffs unbound or bound above applied rates	Share of bound duty free tariff lines to total tar. lines	Total tariff lines
Argentina	100.0	0.0	99.9	99.9	0.0	10530
Australia	96.9	3.1	31.7	34.8	17.7	5520
Brazil	100.0	0.0	91.0	91.0	0.5	10860
Canada	99.8	0.2	45.7	45.9	34.5	6261
Chile	100.0	0.0	99.7	99.7	0.0	5055
Colombia	100.0	0.0	97.7	97.7	0.0	6145
El Salvador	97.1	2.9	96.0	98.9	0.0	4922
European Union	100.0	0.0	17.7	17.7	26.9	7635
Hungary	93.6	6.4	3.3	9.7	10.4	5896
India	69.3	30.7	14.8	45.5	0.0	4354
Indonesia	92.3	7.7	86.6	94.3	0.0	7735
Japan	95.9	4.1	0.1	4.2	47.4	7339
Korea	89.8	10.2	3.4	13.6	11.6	8882
Malaysia	79.3	20.7	31.0	51.7	1.6	10832
Mexico	100.0	0.0	98.4	98.4	0.0	11255
New Zealand	100.0	0.0	46.5	46.5	39.5	5894
Norway	100.0	0.0	36.5	36.5	46.6	5326
Peru	100.0	0.0	98.5	98.5	0.0	4545
Phillipines	67.4	32.6	15.5	48.1	0.0	5387
Poland	92.8	7.2	44.6	51.8	2.2	4354
Singapore	36.5	63.5	11.7	75.2	15.2	4963
Sri Lanka	9.2	90.8	1.4	92.2	0.1	5933
Thailand	67.4	32.6	8.9	41.5	0.0	5244
Tunisia	67.9	32.1	41.5	73.6	0.0	5087
Turkey	49.3	50.7	0.0	50.7	1.4	15479
United States	100.0	0.0	14.0	14.0	39.4	7872
Uruguay	100.0	0.0	96.3	96.3	0.0	10530
Venezuela	100.0	0.0	90.3	90.3	0.0	5974
Zimbabwe	13.6	86.4	3.9	90.3	3.0	1929

Source: Francois (2001), based on WTO and World Bank data on Uruguay Round and post-Information Technology Agreement schedules.

Table 2

Summary of the Effects of Basic Swiss Formula Reductions

Applied tariffs before and after a 50% cut in average tariff bindings

Agriculture

	post-UR and ITA tariffs				effect of basic formula application on tariffs				
	simple average	standard deviation	maximum tariff	binding overhang	simple average	standard deviation	maximum tariff	binding overhang	Percent reduction in average
European Union	5.9	7.5	74.9	0.3	3.0	2.9	10.9	0.1	-48.6
Japan	6.2	8.1	43.3	1.2	3.5	3.7	13.9	0.2	-43.0
United States	3.5	7.4	90.0	0.5	1.9	2.4	11.5	0.1	-46.6
Brazil	12.9	5.1	27.0	22.6	12.4	4.6	22.3	5.3	-3.7
India	31.0	20.8	150.0	90.7	29.5	14.9	70.8	31.3	-4.8
Thailand	26.5	14.4	65.0	7.1	15.1	6.3	30.1	1.7	-43.0

Non-agriculture

	post-UR and ITA tariffs				effect of basic formula application on tariffs				
	simple average	standard deviation	maximum tariff	binding overhang	simple average	standard deviation	maximum tariff	binding overhang	Percent reduction in average
European Union	3.7	3.6	17.0	0.4	1.9	1.4	5.0	0.1	-47.7
Japan	2.3	3.4	30.9	0.1	1.2	1.4	5.6	0.0	-48.5
United States	3.2	4.3	37.5	0.2	1.7	1.6	6.1	0.0	-48.3
Brazil	15.9	6.0	35.0	14.9	13.5	4.2	16.7	1.9	-15.4
India	19.2	16.5	40.0	3.9	11.3	9.2	30.5	0.3	-41.3
Thailand	10.5	10.8	80.0	7.8	7.2	6.1	20.7	2.0	-31.6

Table 3

EU, Japan, and US: Effects of a 50% Reduction in Average Bound Rates

EUROPEAN UNION

	"*a*" parameter	compensation (b) parameter	simple average tariff (percent)	standard error	maximum tariff (percent)	simple average binding overhang (pct points)	Percent reduction in average tariff
*Ag	1	0	5.9	7.5	74.9	0.3	N/A
*Non-Ag	1	0	3.7	3.6	17.0	0.4	N/A
Ag	12.7	1.0	3.0	2.9	10.9	0.1	-48.6
Non-Ag	6.4	1.0	1.9	1.4	5.0	0.1	-47.7
Ag	16.5	1.2	3.0	3.0	13.0	0.1	-48.5
Non-Ag	8.2	1.2	1.9	1.5	5.7	0.1	-47.6
Ag	27.9	1.5	3.0	3.2	17.9	0.1	-48.4
Non-Ag	13.7	1.5	1.9	1.6	7.1	0.1	-47.5

Percent of industrial tariff lines currently unbound: 0%

*Note: *a*=1, *b*=0 corresponds to zero cuts. The first two rows therefore represent post-Uruguay Round (or base) rates of tariffs.

Also, agricultural tariffs are limited to *ad valorem* tariffs. Other specific tariffs may be applied to excluded tariff lines, typically at higher *ad valorem* rates than averages shown.

JAPAN

	"*a*" parameter	compensation (b) parameter	simple average tariff (percent)	standard error	maximum tariff (percent)	simple average binding overhang (pct points)	Percent reduction in average tariff
*Ag	1	0	6.2	8.1	43.3	1.2	N/A
*Non-Ag	1	0	2.3	3.4	30.9	0.1	N/A
Ag	17.1	1.0	3.5	3.7	13.9	0.2	-43.0
Non-Ag	6.3	1.0	1.2	1.4	5.6	0.0	-48.5
Ag	22.7	1.2	3.5	3.9	16.6	0.2	-43.2
Non-Ag	8.1	1.2	1.2	1.5	6.8	0.0	-48.4
Ag	39.6	1.5	3.5	4.2	21.3	0.2	-43.7
Non-Ag	13.9	1.5	1.2	1.6	9.7	0.0	-48.4

Percent of industrial tariff lines currently unbound: 0.84%

*Note: a=1, b=0 corresponds to zero cuts. The first two rows therefore represent post-Uruguay Round (or base) rates of tariffs.

Also, agricultural tariffs are limited to *ad valorem* tariffs. Other specific tariffs may be applied to excluded tariff lines, typically at higher *ad valorem* rates than averages shown.

Table 3 – continued

UNITED STATES							
	"*a*" parameter	compensation (b) parameter	simple average tariff (percent)	standard error	maximum tariff (percent)	simple average binding overhang (pct points)	Percent reduction in average tariff
*Ag	1	0	3.5	7.4	90.0	0.5	N/A
*Non-Ag	1	0	3.2	4.3	37.5	0.2	N/A
Ag	12.4	1.0	1.9	2.4	11.5	0.1	-46.6
Non-Ag	7.2	1.0	1.7	1.6	6.1	0.0	-48.3
Ag	17.4	1.2	1.9	2.6	15.3	0.1	-46.2
Non-Ag	9.5	1.2	1.7	1.7	7.3	0.0	-48.2
Ag	34.7	1.5	1.9	3.0	26.0	0.1	-45.9
Non-Ag	16.2	1.5	1.7	1.9	9.9	0.0	-48.1

Percent of industrial tariff lines currently unbound: 0%

*Note: *a*=1, *b*=0 corresponds to zero cuts. The first two rows therefore represent post-Uruguay Round (or base) rates of tariffs.

Also, agricultural tariffs are limited to *ad valorem* tariffs. Other specific tariffs may be applied to excluded tariff lines, typically at higher *ad valorem* rates than averages shown.

Table 4
Brazil, India, Thailand: Effects of a 50% Reduction in Average Bound Rates

BRAZIL	"*a*" parameter	compen-sation (b) parameter	simple average tariff (percent)	standard error	maximum tariff (percent)	simple average binding overhang (pct points)	Percent reduction in average tariff
*Ag	1	0	12.9	5.1	27.0	22.6	N/A
*Non-Ag	1	0	15.9	6.0	35.0	14.9	N/A
Ag	37.4	1	12.4	4.6	22.3	5.3	-3.7
Non-Ag	31.8	1	13.5	4.2	16.7	1.9	-15.4
Ag	47.0	1.2	12.4	4.6	23.2	5.3	-4.0
Non-Ag	39.8	1.2	13.5	4.3	16.8	1.9	-15.3
Ag	75.8	1.5	12.3	4.6	24.7	5.4	-4.5
Non-Ag	64.3	1.5	13.5	4.4	17.1	1.9	-15.1

Percent of industrial tariff lines currently unbound: 0%

*Note: *a*=1, *b*=0 corresponds to zero cuts. The first two rows therefore represent post-Uruguay Round (or base) rates of tariffs.

Also, agricultural tariffs are limited to *ad valorem* tariffs. Other specific tariffs may be applied to excluded tariff lines, typically at higher *ad valorem* rates than averages shown.

INDIA	"*a*" parameter	compen-sation (*b*) parameter	simple average tariff (percent)	standard error	maximum tariff (percent)	simple average binding overhang (pct points)	Percent reduction in average tariff
*Ag	1	0	31.0	20.8	150.0	90.7	N/A
*Non-Ag	1	0	19.2	16.5	40.0	3.9	N/A
Ag	134.2	1	29.5	14.9	70.8	31.3	-4.8
Non-Ag	38.3	1	11.3	9.2	30.5	0.3	-41.3
Ag	169.9	1.2	29.5	15.0	72.0	31.4	-4.9
Non-Ag	48.1	1.2	11.3	9.3	34.7	0.3	-41.3
Ag	277.2	1.5	29.4	15.1	73.5	31.4	-5.0
Non-Ag	77.6	1.5	11.2	9.3	35.0	0.3	-41.3

Percent of industrial tariff lines currently unbound: 38%

*Note: *a*=1, *b*=0 corresponds to zero cuts. The first two rows therefore represent post-Uruguay Round (or base) rates of tariffs.

Also, agricultural tariffs are limited to *ad valorem* tariffs. Other specific tariffs may be applied to excluded tariff lines, typically at higher *ad valorem* rates than averages shown.

Table 4 -- continued

THAILAND							
	"*a*" parameter	compensation (b) parameter	simple average tariff (percent)	standard error	maximum tariff (percent)	simple average binding overhang (pct points)	Percent reduction in average tariff
*Ag	1	0	26.5	14.4	65.0	7.1	N/A
*Non-Ag	1	0	10.5	10.8	80.0	7.8	N/A
Ag	38.2	1.0	15.1	6.3	30.1	1.7	-43.0
Non-Ag	27.8	1.0	7.2	6.1	20.7	2.0	-31.6
Ag	48.9	1.2	15.1	6.6	34.6	1.7	-42.9
Non-Ag	35.0	1.2	7.2	6.1	23.0	2.0	-31.4
Ag	81.5	1.5	15.1	7.2	43.8	1.7	-42.9
Non-Ag	56.5	1.5	7.2	6.2	27.4	1.9	-31.1

Percent of industrial tariff lines currently unbound: 32%

*Note: *a*=1, *b*=0 corresponds to zero cuts. The first two rows therefore represent post-Uruguay Round (or base) rates of tariffs.
Also, agricultural tariffs are limited to *ad valorem* tariffs. Other specific tariffs may be applied to excluded tariff lines, typically at higher *ad valorem* rates than averages shown.

Table 5
Welfare implications of a 50% reduction in bound tariffs under different degrees of flexibility

	USA % of GDP	EU % of GDP
b=1	0.0548	0.0463
b=1.2	0.0535	0.0455
b=1.5	0.0508	0.0440

Note: For the impact on tariff structures, see Table 4.

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